

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION (PEACE RIVER DISTRICT)
2022 INSPECTION**



Site Number	Location	Name	Hwy	km
SH024-12 SH024-12B* SH024-12A* SH024-12D**	Little Smoky River	Little Smoky River Valley, North Hill – Sites #12, #12B, #12A, and #12D	744:02	20.80-20.90 20.94-21.03 21.03-21.12 21.17-21.30
Legal Description		UTM Co-ordinates		
Site 12: NE21-76-22-W5M		11U E 478,432	N	6,162,375
Site 12B: NE21-76-22-W5M		11U E 478,472	N	6,162,492
Site 12A: NE21-76-22-W5M		11U E 478,504	N	6,162,588
Site 12D: NE21- and SE28-76-22-W5M		11U E 478,550	N	6,162,737

	Date	PF	CF	Total
Previous Inspection:	3-Jun-2020	9	3	27
Current Inspection:	1-Jun-2022	10	3	30
Road AADT:	230		Year:	2022
Inspected By:	Rishi Adhikari, TRANS Max Shannon, TRANS		Ken Froese, Thurber Mark Gallego, Thurber	
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	Highway traverses deep-seated, retrogressive landslides with ongoing creep movements due partly to erosion at toe by the Little Smoky River and Peavine Creek resulting in cracking and sagging of the pavement surface at numerous locations. Approx. 4 km of the highway crosses this unstable north valley slope. These Sites are 55 m to 60 m above and 375 m to 475 m away from the Peavine Creek.		
Dimensions:	Site 12: 85 m length of highway affected by cracking and guardrail distortion. Site 12B: 50 m length of highway with cracking. Site 12A: 90 m length of highway with cracking and slumping. * In 2016, a review of historical documentation for this Site determined that Site #12C should be #12B (south portion) and #12A (north portion). ** Site #12D not assessed since 2015.		
Date of Remediation:	2002: Site #12A subexcavated and reconstructed with pitrun gravel with 2 m high toe berm, subdrain installation, and culvert extension. 2003: Site #12A: culvert lined with 762 mm smooth-wall steel 2004: Site #12 subexcavated and replaced with pitrun gravel with clay toe berm and subdrain; west ditch erosion also repaired.		
Maintenance:	Routine ACP crack sealing, milling, and patching, when required. <u>2017 (post-inspection):</u> Overlay through Sites 13, 15, and 14 2020: Line painting 2021: Overlay, new guardrail and line painting, ditch improvements		
Observations (Site 12):	Description	Worsened?	
<input checked="" type="checkbox"/> Pavement Distress	Vertical distortion removed with overlay – cracks starting to reflect through.	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	Site is located on an active deep-seated landslide moving toward the Peavine Creek.	<input checked="" type="checkbox"/>	

	There is short section of vertical distortion of the new guardrail.	
<input type="checkbox"/> Erosion		<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	Minor rilling and ponding of water at both ends of approach culvert under TR764.	<input checked="" type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
Observations (Site 12B):	Description	Worsened?
<input checked="" type="checkbox"/> Pavement Distress	Scarp crack not yet reflected through 2021 overlay.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Site is located on an active deep-seated landslide moving toward the Peavine Creek.	<input type="checkbox"/>
<input type="checkbox"/> Erosion		<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
Observations (Site 12A):	Description	Worsened?
<input checked="" type="checkbox"/> Pavement Distress	Some traverse cracking was reflected through; may not be related to slope movement.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Site is located on an active deep-seated landslide moving toward the Peavine Creek. The toe berm appears to be functioning to stabilize the local embankment. New slump noted in 2022 in gravel placed on shoulder north of culvert.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Minor erosion along grassed-lined channel at culvert outlet (km 21.081). Inlet end of ditch has been lined with erosion covering.	<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	Culvert at km 21.081: outlet of SWSP liner is rusting.	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
Instrumentation: None		
Assessment:		
<p>The overall valley slope is moving as several separate slide blocks in response to the toe erosion and downcutting of two different rivers resulting in numerous scarps, sag ponds, and differential movement zones going in slightly different directions. The highway intersects the scarps of these blocks at several locations resulting in an uneven highway surface and cracking.</p> <p>Site 12: The main slide scarp crack typically visible at the Township Road 764 (TR764) intersection has not yet reflected through the new overlay; however, some portions of that pattern have become re-established. There appeared to be a slightly vertical sag of the new guardrail (installed in 2021) across from the TR764 intersection in the same location where the previous guardrail was also deformed. Overall, the toe berm appears to be functioning to stabilize the highway fill embankment;</p>		

however, it is not conclusive if the pavement cracking and guardrail deformation is related to the local or global slope movements.

Site 12B:

This site, an area of additional cracking between the two toe berms at Site #12 and Site #12A, was discontinued from the GeoHazard Assessment program in 2007. At the time of the 2016 inspection, there appeared to be a long crack roughly parallel to the highway that may be associated with slope movement and the width and extents of cracking have increased slightly each year following. However, only minor transverse cracks have re-appeared since the 2021 overlay and more time will be required to determine if the full crack pattern will become established. A small, dormant slump was noted this year and has been added to the drawing for completeness.

Site 12A:

Some of the longitudinal has reflected through the new overlay; the previous transverse cracking has yet to appear. Although these cracks on the highway are above the toe berm, they do not appear to be related slope movement (at this time). During the grading work, gravel was loosely placed on the east side of the highway embankment just north of the culvert. This material was placed too steeply and is starting to slump. A toe roll was observed at the bottom of the slope. It is possible that the slumping is occurring only within the loose gravel; however, it should be regraded at a flatter slope, spread out along more of the embankment, or removed out of the valley to prevent destabilizing the highway embankment itself.

Recommendations:

Short-Term:

- Road maintenance should continue as necessary to maintain a safe roadway surface and may consist of milling, patching, and crack sealing of the ACP.
- The loose gravel fill at Site 12A should be graded and track-packed into a flatter downslope configuration and monitored for any additional movement.

Long-Term:

It is understood that, at this time, the only long-term remediation option under consideration is realignment of the entire north hill section of Highway 744. However, given the high cost of this option and as it is a low volume highway, it is unlikely that realignment will be undertaken in the near future. Consideration could be given to a shorter realignment which would include Site #12 and potentially a portion of Site #12B. Site #12A would not be included in this shorter realignment option.

Ongoing Investigation:

- It is recommended that the twice-per-contract Geohazard inspection should continue as scheduled. If a drill rig is in the area on other projects, installation of inclinometers through the toe berms at Site 12 and 12A would be useful to determine the presence, depth, and movement rate of potential deeper-seated failure surfaces that could have long-term implications for the highway.

Closure:

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

Don Proudfoot, P.Eng.
Principal | Senior Geotechnical Engineer

Ken Froese, P.Eng.
Senior Geotechnical Engineer



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

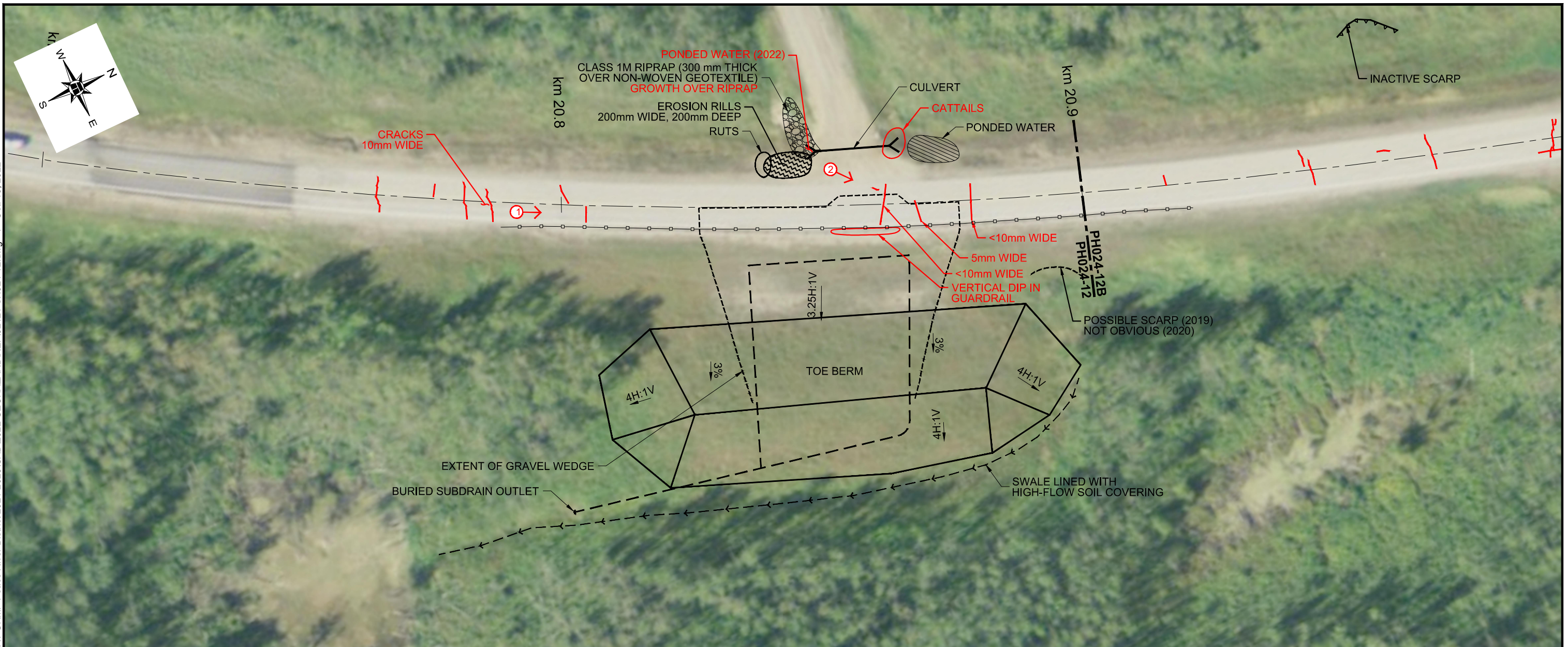
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

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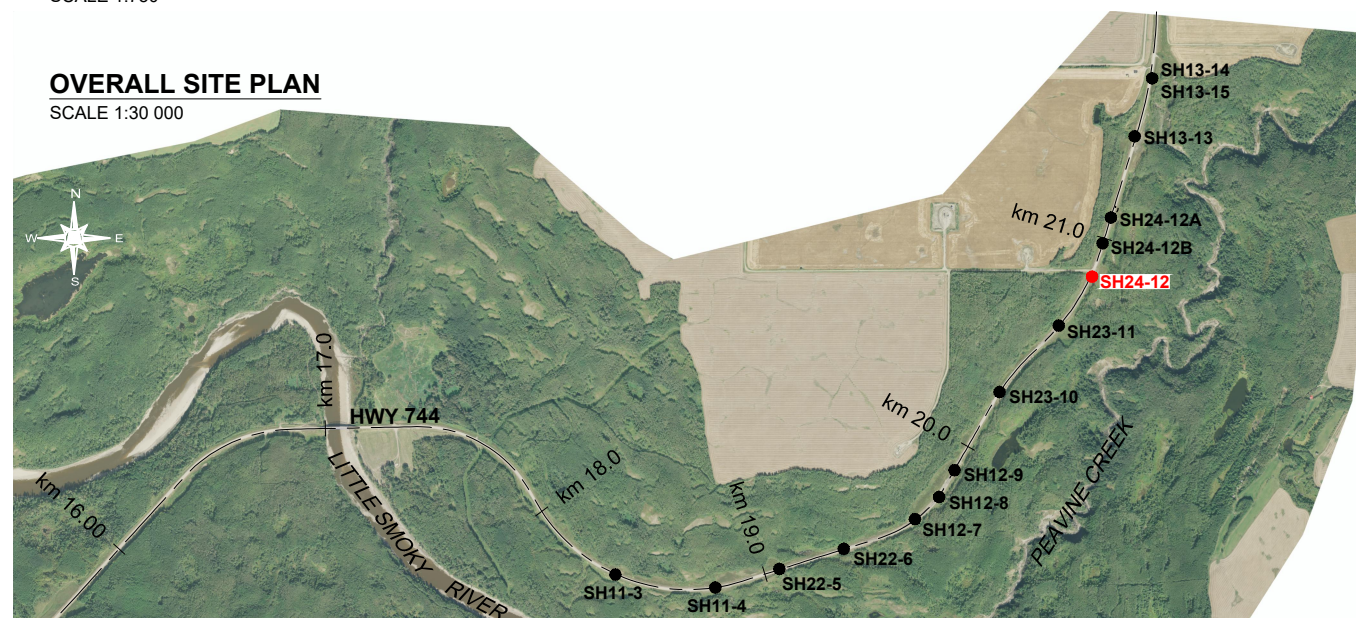


DETAILED SITE PLAN

SCALE 1:750

OVERALL SITE PLAN

SCALE 1:30 000



LEGEND

- CULVERT
- GUARDRAIL
- DIRECTION AND NUMBER OF PHOTO

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK (2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030, PROVIDED BY ALBERTA TRANSPORTATION).
3. JUNE 2022 OBSERVATIONS SHOWN IN RED.
4. CRACK AND PATCH PATTERNS RESET USING 2022 UAV IMAGERY AS HWY 744 WAS OVERLAID IN SUMMER 2021.
5. GUARDRAIL AND CULVERT LOCATIONS TAKEN FROM MCINTOSH PERRY AS-BUILT DRONE SURVEY (JULY 2021).



SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)



PEACE REGION (SWAN HILLS)

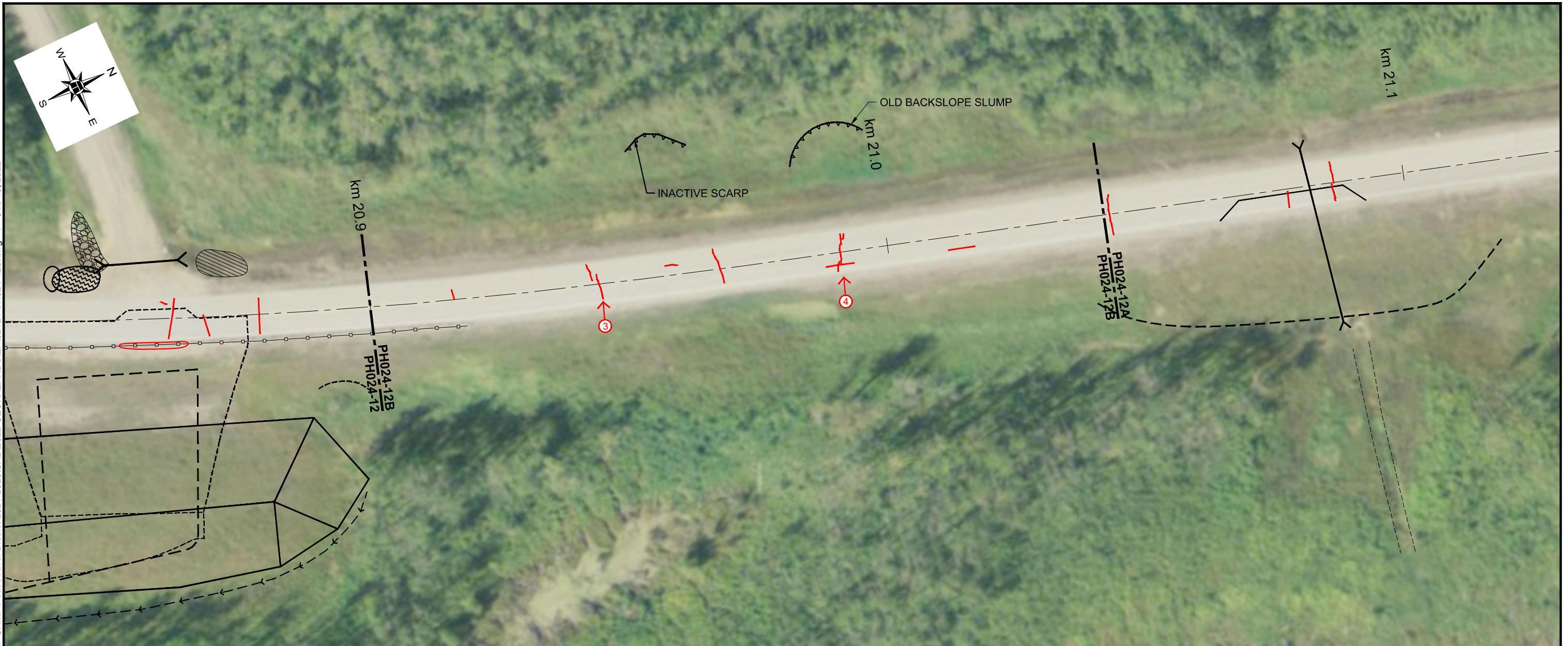
**SH024-12: HWY 744:02 LITTLE SMOKY RIVER VALLEY
2022 SITE INSPECTION PLAN**

DWG No. 32121-SH024-12

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	OCTOBER 2022
FILE No.	32121



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DETAILED SITE PLAN
SCALE 1:750

OVERALL SITE PLAN
SCALE 1:30 000



LEGEND

- CULVERT
- GUARDRAIL
- RED TEMPORARY HAZARD SIGN
- DIRECTION AND NUMBER OF PHOTO

NOTES

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3. JUNE 2022 OBSERVATIONS SHOWN IN RED.
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SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)



PEACE REGION (SWAN HILLS)

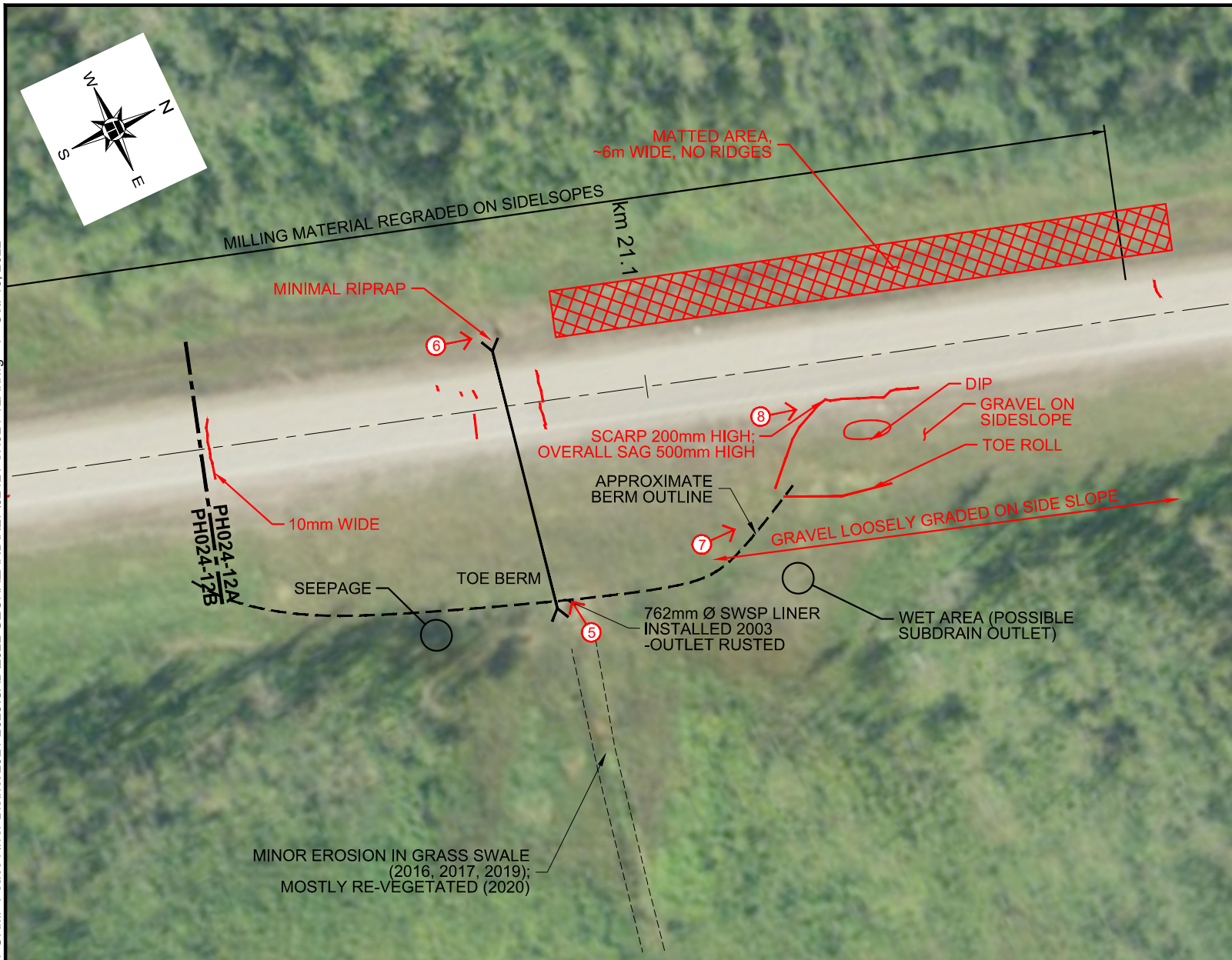
**SH024-12B: HWY 744:02 LITTLE SMOKY RIVER VALLEY
2022 SITE INSPECTION PLAN**

DWG No. 32121-SH024-12B

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	OCTOBER 2022
FILE No.	32121



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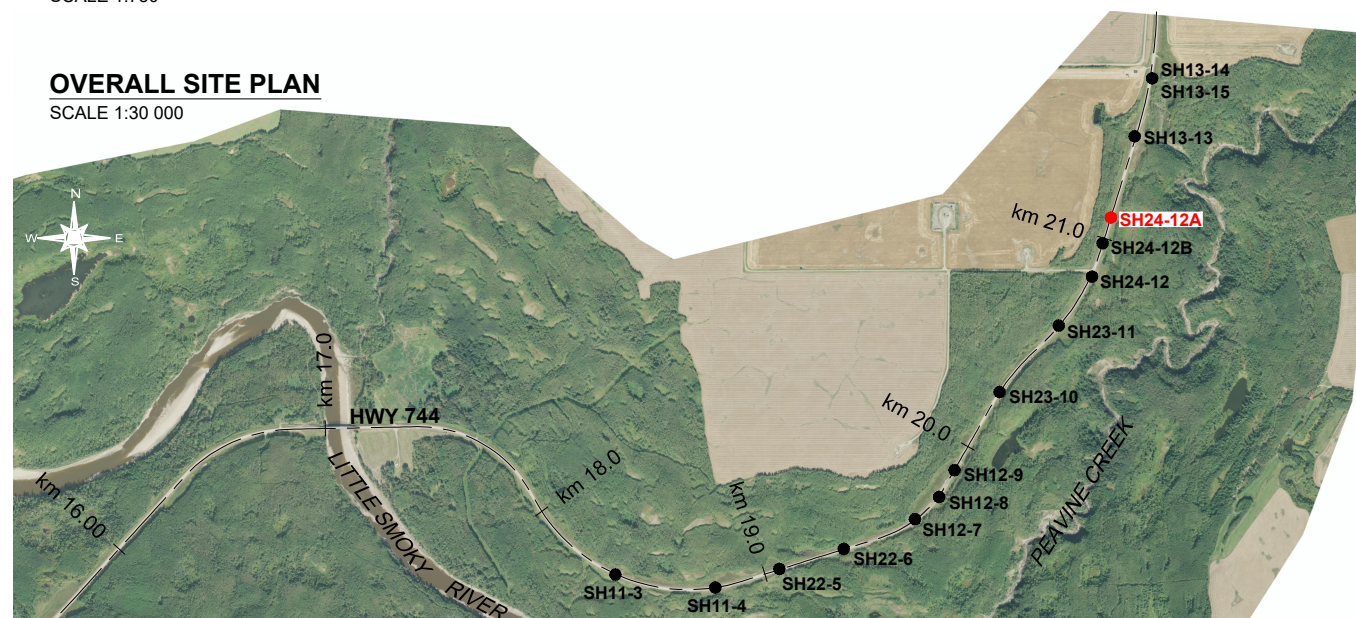


DETAILED SITE PLAN

SCALE 1:750

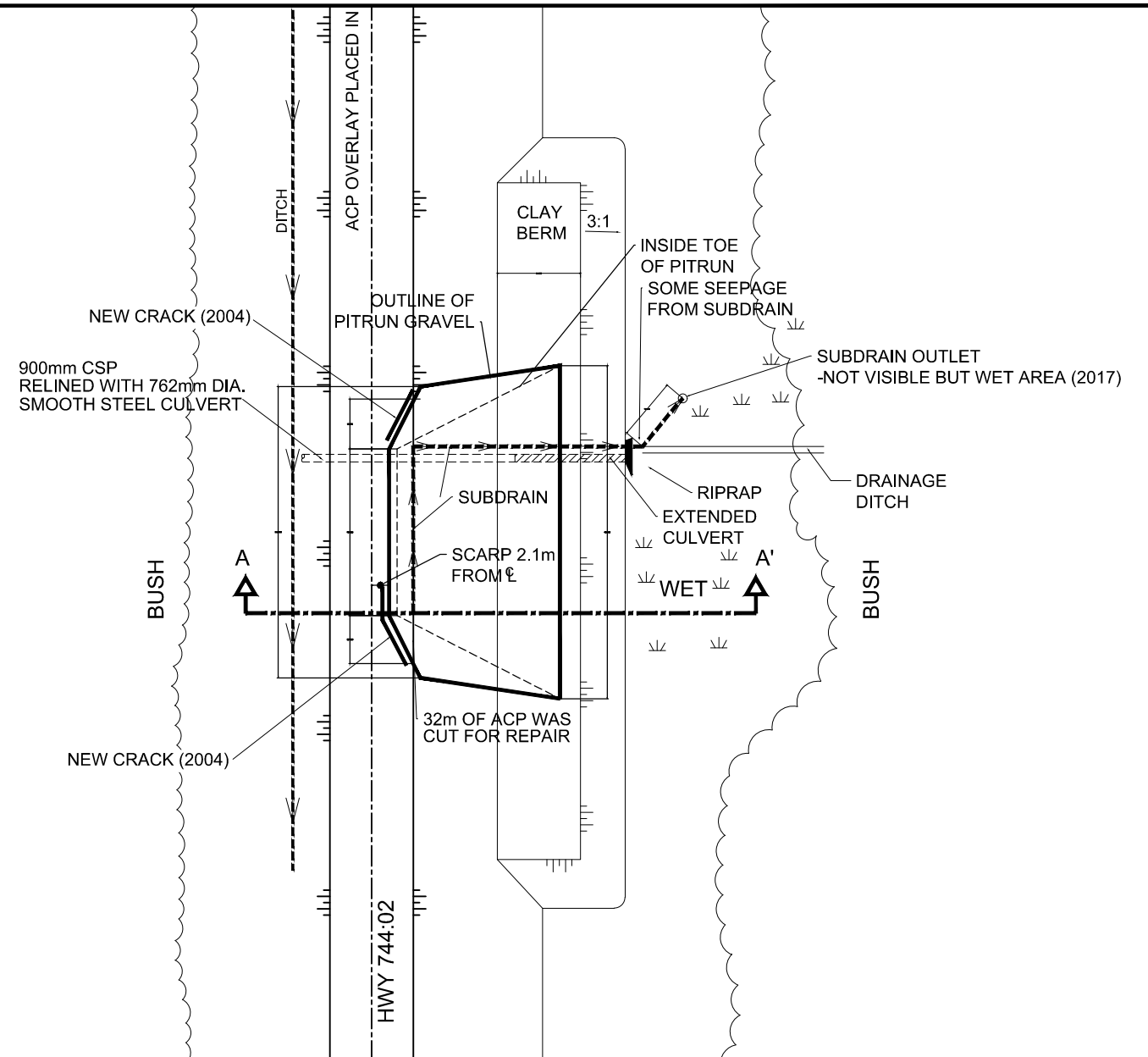
OVERALL SITE PLAN

SCALE 1:30 000





SCHEMATIC AS-BUILT PLAN

NTS



LEGEND

-  CULVERT
-  DIRECTION AND NUMBER OF PHOTO

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK (2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030, PROVIDED BY ALBERTA TRANSPORTATION).
3. JUNE 2022 OBSERVATIONS SHOWN IN RED.
4. CRACK AND PATCH PATTERNS RESET USING 2022 UAV IMAGERY AS HWY 744 WAS OVERLAID IN SUMMER 2021.
5. GUARDRAIL AND CULVERT LOCATIONS TAKEN FROM MCINTOSH PERRY AS-BUILT DRONE SURVEY (JULY 2021).



SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)



PEACE REGION (SWAN HILLS)

**SH024-12A: HWY 744:02 LITTLE SMOKY RIVER VALLEY
2022 SITE INSPECTION PLAN**

DWG No. 32121-SH024-12A

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	OCTOBER 2022
FILE No.	32121





Photo 1, Site 12 – Looking northeast over toe berm. The guardrail was replaced in 2021 during the Highway 744 overlay project.



Photo 2, Site 12 – Looking south from north of the TR764 intersection at where the main scarp crack was located. It had just started reflecting through the new overlay.



Photo 3, Site 12B: Looking west at one of the transverse cracks that has reflected through the new overlay near the south end of site.



Photo 4, Site 12B – Looking west at the second transverse crack that has started reflecting through the new overlay.



Photo 5, Site 12A – Looking at culvert liner outlet.



Photo 6, Site 12A – Regraded upslope ditch at culvert liner inlet.



Photo 7, Site 12A – Looking north at potential toe roll on downslope slide where excess gravel appears to have been wasted on the sideslope.



Photo 8, Site 12A – Looking north at top of gravel pile on downslope shoulder where a scarp is forming close to the highway.